

What is claimed is:

1. A digital watermarking apparatus comprising:
area specifying means for specifying a predetermined
5 area in which a digital watermark is to be embedded, said
predetermined area being included in received image signals;
encryption data generating means for encrypting the
digital watermark and for outputting encryption data; and
mixing means for comparing an average of intensity values
10 or color difference values of all pixels in a first area in
the predetermined area in the received image signals with an
intensity value or a color difference value of each pixel in
a second area that is an area other than the first area in
the predetermined area to find, for all pixels in the second
15 area, a first counter value and a second counter value, said
first counter value indicating a number of pixels each of which
has an intensity value or a color difference value larger than
the average, said second counter value indicating a number
of pixels each of which has an intensity value or a color
20 difference value smaller than the average, for transforming
the intensity value or the color difference value of each pixel
in the second area such that a relation between the first counter
value and the second counter value becomes a preset relation
according to a first value or a second value of the encryption
25 data from said encryption data generating means, and for
outputting the received image signals as watermarked image
signals.

2. The digital watermarking apparatus according to claim
30 1, wherein said mixing means comprises:

average calculating means for calculating the average
of the intensity values or the color difference values of the
pixels in the first area in the predetermined area of the
received image signals;

35 counter value calculating means for comparing the
average with the intensity value or the color difference value

of each pixel in the second area that is an area other than the first area in the predetermined area to calculate, for all pixels in the second area, the first counter value and the second counter value, said first counter value indicating the number of pixels each of which has an intensity value or a color difference value larger than the average, said second counter value indicating the number of pixels each of which has an intensity value or a color difference value smaller than the average;

10 counter value comparing means for comparing the first counter value and the second counter value; and

15 transforming means for transforming the intensity values or the color difference values of all pixels in the second area such that, when the value of the encryption data from said encryption generating means is the first value, said counter value comparing means gives a comparison result indicating that the first counter value is larger than the second counter value and such that, when the value of the encryption data from said encryption generating means is the second value, said counter value comparing means gives a comparison result indicating that the first counter value is smaller than the second counter value.

20 wherein the transformed signals are output as the watermarked image signals, the intensity value or the color difference value or each pixel in the second area of the transformed signals being transformed by said transforming means according to the value of the encryption data.

3. A digital watermarking method comprising:

30 a first step for specifying a predetermined area in which a digital watermark is to be embedded, said predetermined area being included in received image signals;

a second step for encrypting the digital watermark and for outputting encryption data; and

35 a third step for comparing an average of intensity values or color difference values of all pixels in a first area in

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the predetermined area in the received image signals with an intensity value or a color difference value of each pixel in a second area that is an area other than the first area in the predetermined area to find, for all pixels in the second area, a first counter value and a second counter value, said first counter value indicating a number of pixels each of which has an intensity value or a color difference value larger than the average, said second counter value indicating a number of pixels each of which has an intensity value or a color difference value smaller than the average, and

5 a fourth step for transforming the intensity value or the color difference value of each pixel in the second area such that a relation between the first counter value and the second counter value becomes a preset relation according to
10 a first value or a second value of the encryption data and for outputting the received image signals as watermarked image signals.

20 4. The digital watermarking method according to claim
3, wherein said third step comprises:

15 a fifth step for calculating the average of the intensity values or the color difference values of the pixels in the first area in the predetermined area of the received image signals; and

25 a sixth step for comparing the average with the intensity value or the color difference value of each pixel in the second area that is an area other than the first area in the predetermined area to calculate, for all pixels in the second area, the first counter value and the second counter value, said first counter value indicating the number of pixels each of which has an intensity value or a color difference value larger than the average, said second counter value indicating the number of pixels each of which has an intensity value or a color difference value smaller than the average,
30 and wherein said fourth step comprises:

35 a seventh step for comparing the first counter value

and the second counter value; and

an eighth step for transforming the intensity values or the color difference values of all pixels in the second area such that, when the value of the encryption data is the

5 first value, a comparison result indicating that the first counter value is larger than the second counter value is obtained and such that, when the value of the encryption data is the second value, a comparison result indicating that the first counter value is smaller than the second counter value

10 is obtained.

5. A digital watermark reproducing apparatus comprising:

area specifying means for receiving digitally watermarked image signals as input signals and for specifying a predetermined area, said digitally watermarked image signals being generated by transforming signals in the predetermined area of the image signals according to a value of encryption data generated by encrypting a digital watermark;

extracting means for comparing an average of intensity values or color difference values of all pixels in a first area in the predetermined area in the digitally watermarked image signals with an intensity value or a color difference value of each pixel in a second area that is an area other

25 than the first area in the predetermined area to find, for all pixels in the second area, a first counter value and a second counter value, said first counter value indicating a number of pixels each of which has an intensity value or a color difference value larger than the average, said second

30 counter value indicating a number of pixels each of which has an intensity value or a color difference value smaller than the average, and for extracting from the predetermined area the encryption data which is determined to be a first value or a second value according to a relation between the first

35 counter value and the second counter value; and

a decrypting means for decrypting the extracted the

encryption data to an original watermark for output.

6. A digital watermark reproducing apparatus according to claim 5, wherein

5 said extracting means comprises:

average calculating means for calculating the average of the intensity values or the color difference values of the pixels in the first area in the predetermined area of the digitally watermarked image signals;

10 counter value calculating means for comparing the average with the intensity value or the color difference value of each pixel in the second area that is an area other than the first area in the predetermined area to calculate, for all pixels in the second area, the first counter value and the second counter value, said first counter value indicating the number of pixels each of which has an intensity value or a color difference value larger than the average, said second counter value indicating the number of pixels each of which has an intensity value or a color difference value smaller than the average;

15 counter value comparing means for comparing the first counter value and the second counter value; and

20 encryption data extracting means for extracting the encryption data determined to be the first value when said counter value comparing means gives a comparison result indicating that the first counter value is larger than the second counter value or for extracting the encryption data determined to be the second value when said counter value comparing means gives a comparison result indicating that the first counter value is smaller than the second counter value.

25 7. A digital watermark reproducing method comprising:

30 a first step for receiving digitally watermarked image signals as input signals and for specifying a predetermined area, said digitally watermarked image signals being generated by transforming signals in the predetermined area of the image

signals according to a value of encryption data generated by encrypting a digital watermark;

a second step for comparing an average of intensity values or color difference values of all pixels in a first area in the predetermined area in the digitally watermarked image signals with an intensity value or a color difference value of each pixel in a second area that is an area other than the first area in the predetermined area to find, for all pixels in the second area, a first counter value and a second counter value, said first counter value indicating a number of pixels each of which has an intensity value or a color difference value larger than the average, said second counter value indicating a number of pixels each of which has an intensity value or a color difference value smaller than the average;

a third step for extracting from the predetermined area the encryption data which is determined to be a first value or a second value according to a relation between the first counter value and the second counter value; and

20 a fourth step for decrypting the extracted encryption
data to an original watermark for output.

8. A digital watermark reproducing method according to claim 7,

25 wherein said second step comprises:

a fifth step for calculating the average of the intensity values or the color difference values of the pixels in the first area in the predetermined area of the digitally watermarked image signals; and

30 a sixth step for comparing the average with the intensity
value or the color difference value of each pixel in the second
area that is an area other than the first area in the
predetermined area to calculate, for all pixels in the second
area, the first counter value and the second counter value,
35 said first counter value indicating the number of pixels each
of which has an intensity value or a color difference value

larger than the average, said second counter value indicating the number of pixels each of which has an intensity value or a color difference value smaller than the average, and wherein said third step comprise:

5 a seventh step for comparing the first counter value and the second counter value; and

an eighth step for extracting the encryption data determined to be the first value when said seventh step gives a comparison result indicating that the first counter value 10 is larger than the second counter value or for extracting the encryption data determined to be the second value when said seventh step gives a comparison result indicating that the first counter value is smaller than the second counter value.